IN THE CLAIMS:

Please amend the claims as follows:

1. (Original) A method for decoding a linear code on ring R, the method being characterized by including:

a low-density processing step for reducing the density of elements whose values are determined to be one, for a check matrix of the linear code; and

a decoding step for decoding the linear code through a sum product algorithm by using the check matrix whose density is reduced through the low-density processing step.

2. (Original) The decoding method according to Claim 1, characterized in that the ring is a finite field including powers of prime numbers, as elements.

3. (Original) The decoding method according to Claim 2, characterized in that the linear code includes a BCH code, or a Reed-Solomon code on the finite field.

4. (Original) The decoding method according to Claim 1, characterized in that the low-density processing step includes:

a linear-combination calculation step for calculating linear combination of rows of the check matrix; and

a check-matrix generation step for extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination calculated through the linear-combination calculation step and generating a new check matrix including all the vectors of the vector subset, as row elements.

5. (Original) The decoding method according to Claim 4, characterized in that the low-density processing step further includes:

an expansion step for expanding the check matrix on the finite field on a predetermined subfield of the finite field in a predetermined degree,

wherein the linear-combination calculation step is provided for calculating linear combination of the rows of the check matrix expanded through the expansion step.

6. (Original) A decoder for a linear code on ring R, the decoder being characterized by including:

low-density processing means that performs low-density processing for reducing the density of elements whose values are determined to be one, for a check matrix of the linear code; and

decoding means for decoding the linear code through a sum product algorithm by using the check matrix whose density is reduced by the low-density processing means.

7. (Original) The decoder according to Claim 6, characterized in that the ring is a finite field including powers of prime numbers, as elements.

8. (Original) The decoder according to Claim 7, characterized in that the linear code includes a BCH code, or a Reed-Solomon code on the finite field.

9. (Original) The decoder according to Claim 6, characterized in that the low-density processing means includes:

linear-combination calculation means for calculating linear combination of rows of the check matrix; and

check-matrix generation means for extracting a subset of lower-weight vectors for forming a complementary space from among a vector set obtained by the linear combination calculated by the linear-combination calculation means and generating a new check matrix including all the vectors of the vector subset, as row elements.

10. (Original) The decoder according to Claim 9, characterized in that the low-density processing means further includes expansion means for expanding the check matrix on the finite field on a predetermined subfield of the finite field in a predetermined degree,

wherein the linear-combination calculation means calculates linear combination of rows of the check matrix expanded through the expansion means.

11. (Original) The decoder according to Claim 6, characterized by further including soft-decision decoding means for performing soft-decision decoding for a linear code subjected to convolutional encoding,

wherein the low-density processing means reduces the density of the elements whose values are determined to be one, for the check matrix of the linear code subjected to the soft-decision decoding by the soft-decision decoding means.

12. (Original) The decoder according to Claim 11, characterized in that the soft-decision decoding by the soft-decision decoding means, the low-density processing by the low-density processing means, and the decoding by the decoding means are repetitively performed.

13. (Cancelled)

14. (Original) A method for decoding a linear code on ring R, the decoding method being characterized by including:

an input step for inputting a reception value; and

a decoding step for decoding the linear code through a sum product algorithm, for a check matrix of the linear code, by using the check matrix, where the density of elements whose values are determined to be one is reduced, and the reception value input through the input step.

15. (Original) A decoder for a linear code on ring R, the decoder being characterized by including:

input means for inputting a reception value; and

decoding means for decoding the linear code through a sum product algorithm, for a check matrix of the linear code, by using the check matrix, where the density of elements whose values are determined to be one is reduced, and the reception value input by the input means.

16. (Original) A program for making a computer decode a linear code on ring R, characterized in that the computer is made to perform processing including:

an input step for inputting a reception value; and

a decoding step for decoding the linear code through a sum product algorithm, for a check matrix of the linear code, by using the check matrix, where the density of elements whose values are determined to be one is reduced, and the reception value input through the input step.

Cancel claims 17-32.